MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

VOL. XXVIII. JUNE, 1900. No. 6

INTRODUCTION.

The MONTHLY WEATHER REVIEW for June, 1900, is based on reports from about 3,101 stations furnished by employees and voluntary observers, classified as follows: regular stations of the Weather Bureau, 158; West Indian service stations, 12; special river stations, 132; special rainfall stations, 48; voluntary observers of the Weather Bureau, 2,562; Army post hospital reports, 22; United States Life-Saving Service, 9; Southern Pacific Railway Company, 96; Canadian Meteorological Service, 32; Mexican Telegraph Service, 20; Mexican voluntary stations, 7; Mexican Telegraph Company, 3. International simultaneous observations are received from a few stations and used, together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Hawaiian Government Survey, Honolulu; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Mr. Maxwell Hall, Government Meteorologist, Kingston, Jamaica; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; and Commander Chapman C. Todd, Hydrographer, United States Navy.

The REVIEW is prepared under the general editorial supervision of Prof. Cleveland Abbe.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30′ or $10^h\ 30^m$ west of Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local standard is mentioned.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

No severe storms of a general character occurred in the United States or the West Indies during June, 1900.

The weather continued very dry in the Northwestern States, and the upper Mississippi River reached the lowest June stage noted in many years.

The local rains of the month were, as a rule, forecast.

CHICAGO FORECAST DISTRICT.

No special warnings of storms were issued. The daily forecasts, however, were of great value, especially on account of the critical condition of the spring wheat in the Northwest. The showers which occurred in that section were generally forecast.—*H. J. Cox, Professor.*

SAN FRANCISCO FORECAST DISTRICT.

The month has been, as a whole, uneventful. There were no serious northers.—*Alexander G. McAdie, Forecast Official.*

PORTLAND, OREG., FORECAST DISTRICT.

The month was free from all unusual atmospheric disturbances, and no frost or storm warnings were issued.—*Edward A. Beals, Forecast Official.*

HAVANA FORECAST DISTRICT.

No disturbances occurred during the month, and no special warnings were issued.—*William B. Stockman, Forecast Official.*

AREAS OF HIGH AND LOW PRESSURE.

During the month there were charted five highs and eight lows. (See Charts I and II.) A brief description of some of their more marked characteristics follows herewith:

Highs.—No. I was the final development of the Pacific coast high which persisted, with varying intensity, during the second and third decades of the previous month. On the last day of May it began to move eastward from the Washington coast, maintained an almost due easterly course, and in four days passed over Cape Breton Island into the Atlantic. During its passage over Montana and the Dakotas, on the 1st and 2d, light frosts were quite numerous. No. II originated in the Valley of the Red River of the North, and moved eastward off the Massachusetts coast in two and one-half days. No. III originated in the central Rocky Mountain region, moved northeastward to Lake Superior, and thence eastward over Cape Breton Island. No. IV first appeared in southern Alberta, moved southeastward to northern Kansas, and thence northeastward to western Lake Superior; afterwards its progress was generally eastward to central Ontario, where it dissipated. No. V was first noticed on the California coast,

moved northward to British Columbia, thence eastward to Manitoba, and thence east-southeastward to the southern New Jersey coast. It was last noticed at Bermuda, seven and one-half days after leaving California, and was then at its maximum intensity.

In addition to the highs which had a definite movement, there were several others, which remained stationary for a number of days and then disappeared. Of such a character were those on the Pacific coast from the 3d to the 7th, the 15th to the 19th, and after the 25th. This latter high persisted, after sending off to the northward and eastward a moderate wave, which has already been described above as No. V.

It is also worthy of note that none of the highs moved across that portion of the country south of the fortieth parallel.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	31, a.m.*	47	123	4, a.m.	46	60	3,425	4.0	856	35.7
II	8, a.m.	47	97	10, p.m.	42	70	1,480	2.5	592	24.7
III	10, a.m.	43	109	14, a.m.	46	60	2,630	4.0	658	27.4
IV	12, a.m.	51	114	15, p.m.	45	80	2,395	3.5	684	28.5
V	25, p.m.	41	124	3, a.m.†	33	65	4,195	7.5	559	23.3
Sums							14,125	21.5	3,349	139.6
Mean of 5 paths							2,825		670	27.9
Mean of 21.5 days									657	27.4
Low areas.										
I	30, p.m.*	39	109	2, p.m.	43	70	2,100	3.0	700	29.2
II	2, a.m.	54	114	3, p.m.	43	100	1,075	1.5	717	29.9
III	5, a.m.	54	114	8, p.m	48	68	2,220	3.5	634	26.4
IV	7, p.m.	52	114	{13, a.m. {14, p.m.	48 35	52 90	2,960	4.5 7.0	658 423	27.4 17.6
V	13, a.m.	42	91	16, a.m.	48	52	1,935	3.0	645	26.9
VI	22, p.m.	32	96	24, p.m.	35	90	655	2.0	328	13.7
VII	24, p.m.	48	104	1, p.m.†	46	60	2,275	7.0	325	13.5
VIII	28, p.m.	43	112	9, a.m.†	48	68	3,575	10.5	340	14.2
Sums							19,755	42.0	4,770	198.8
Mean of 9 paths							2,195		530	22.1
Mean of 42 days									470	19.6

*May. †July.

Lows.—No. I originated in western Colorado, moved northeastward to western South Dakota, and thence eastward off the Maine coast. Nos. II, III, and IV first came within the field of observation in Alberta. No. II moved southeastward to northern Nebraska, where it dissipated. No. III and one section of No. IV continued almost due eastward to the Atlantic. The second section of No. IV moved southeastward and southward through Texas to western Gulf of Mexico, turned northward through Mississippi, and dissipated in extreme western Tennessee. No. V was an offshoot from the northern edge of the lower section of No. IV. It moved from eastern Iowa northeastward through the St. Lawrence Valley and Newfoundland. No. VI was a moderate local disturbance in the west Gulf States. No. VII originated in northwestern North Dakota, and quite closely followed the paths of No. III and the upper section of No. IV. No. VIII was at once the most pronounced, peculiar, and persistent depression of the month. It originated during the 28th in southeastern Idaho, pursued a very slow and erratic course for seven and one-half days over the northern and middle slopes, dipping down into eastern Colorado, and finally, turning eastward from eastern North Dakota, it passed out of the St. Lawrence Valley ten and one-half days after it was first noted in Idaho. The minimum pressure reached was 29.20 inches, at Winnipeg, on the morning of July 6.

There was a pronounced low over Texas from the evening of the 16th until the morning of the 19th. It moved very slightly and was accompanied by high temperatures with very little rain. There was also a practically continuous depression over the British Northwest Territory from the 14th to the 26th, resulting, as a rule, in temperatures considerably above normal over the district from the Mississippi Valley westward to the Rocky Mountains.

There were two lows which first came within the field of observation in northern New Brunswick. The center of one depression reached Father Point on the evening of the 21st, and the other three days later. A study of the pressure conditions for several days previous leads to the conclusion that these lows moved southeastward over the country north of the sixtieth parallel, and were probably prevented from extending farther to the southward by the ridge of high pressure which at that time overspread the country from Minnesota eastward.—*H. C. Frankenfield, Forecast Official.*

RIVERS AND FLOODS.

In the Mississippi River above the mouth of the Ohio River there was a gradual though steady decrease in the water stages, except below the mouth of the Missouri River, where the fall was interrupted by the advent of a moderate tide from the latter river, which set in about the 21st. The average stages in the Missouri River were about 1.5 foot higher than during May, 1900.

Below Cairo, Ill., the average stages of the Mississippi River were also somewhat lower than during May, although there was a rise during the third decade, due to a combination of the rise out of the Missouri River and another from the Tennessee River. This latter river was above the danger line of 21 feet at Johnsonville, Tenn., after the 26th, reaching a stage of 29.5 feet on the 30th, but with only some minor damage to growing crops.

As compared with June, 1899, the stages throughout the entire Mississippi system were considerably lower, except in the Tennessee River.

River matters over the Atlantic and Gulf systems were uneventful except in Alabama and the South Atlantic States. In the former State the heavy rains from the 23d until the 28th caused a rapid rise in the rivers, and danger-line stages were reached at many points. The following report on the floods in the Coosa and Alabama rivers was made by Mr. F. P. Chaffee, Official in Charge of the Weather Bureau office at Montgomery, Ala:

Heavy rains over the watershed of the Coosa River on June 23 and 24 started a rather rapid rise in the tributaries of that river on the 24th, and warning was then issued for a rapid rise at Rome, Ga., and as far south as Wetumpka, Ala., during the next two days, with moderate flood stages at Gadsden, Ala. The heavy rains continued through the 25th, spreading southward over the middle portion of the State, and supplemental warnings were issued for about a 22-foot stage (or 4 feet above danger line) at Gadsden, 33 feet at Wetumpka, 31 feet at Montgomery, and 32 feet at Selma, Ala. The rivers rose steadily at all points during the 25th and 26th, the rise being nearly 14 feet in forty-eight hours at Wetumpka, about 13 feet at Montgomery, and nearly 11 feet at Selma. Additional heavy rains fell over the entire watershed on the 27th and 28th, and further warning was issued on the morning of the 28th for a continued but slow rise in the Alabama River, and advising the removal of stock and other movable property from lands subject to overflow at 35 feet, from above Wetumpka, to about 100 miles south of Selma. The waters reached the 34.8-foot mark at Wetumpka, during the night of 27–28th, 33.2 feet at Montgomery during afternoon of the 29th, and 35 feet at Selma, by morning of the 30th. The warnings were very widely distributed by telegraph, telephone, and mail, and through the local press; it is thought that there was not a city, town, or village, along the rivers mentioned, which did not receive ample warning in advance of these high waters, which were the highest in any June for which we have a record. The stages specified were not exceeded, and were very nearly, if not quite, reached in every case.

Large numbers of stock which were pastured in the low grounds were driven to places of safety; considerable hay and oats, which would otherwise have been ruined, were cut and carried to higher ground, and much green corn, which would have been a total loss, was cut down and saved for stock food. However, much damage was done, which no warning could avert, especially to lowland corn and cotton, large areas of which were inundanted and entirely ruined, though the waters have now receded and much of the inundated district will be replanted in corn. The warnings, it is thought, were the means of saving at least $35,000 worth of stock and other property.

The lower Tombigbee and the Black Warrior rivers were also from 17 to 20 feet above the danger lines, but no reports of serious damage have been received. The rivers of the South Atlantic States, while quite high, did not reach danger-line stages.

The highest and lowest water, mean stage, and monthly range at 132 river stations are given in Table XI. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are: Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Forecast Official.*

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the respective sections of the Climate and Crop Service. The name of the section director is given after each summary.

Rainfall is expressed in inches and temperature in degrees Fahrenheit.

Alabama.—The mean temperature was 76.4°, or about 2.0° below normal; the highest was 98°, at Brewton on the 30th, and the lowest, 58°, at Clanton on the 5th. The average precipitation was 11.08, or about 7.00 above normal; the greatest monthly amount, 26.67, occurred at Mobile, and the least, 5.55, at Marion.—*F. P. Chaffee.*

Arizona.—The mean temperature was 81.5°, or 0.5° above normal; the highest was 120°, at Texas Hill on the 27th, and the lowest, 30°, at Snowflake on the 3d. The average precipitation was 0.03, or 0.21 below normal; the greatest monthly amount, 0.72, occurred at Flagstaff, while none fell at a great number of stations.—*W. G. Burns.*

Arkansas.—The mean temperature was 76.6°, or 0.6° below normal; the highest was 100°, at Jonesboro on the 10th, and the lowest, 43°, at Witts Springs on the 4th. The average precipitation was 7.10, or 3.22 above normal; the greatest monthly amount, 16.11, occurred at Elon, and the least, 3.05, at Arkadelphia.—*E. B. Richards.*

California.—The mean temperature was 71.4°, or 0.9° above normal; the highest was 121°, at Salton on the 30th, and the lowest, 21°, at Bodie on the 16th. The average precipitation was 0.19, or 0.11 below normal; the greatest monthly amount, 2.67, occurred at Boca, while none fell at 61 stations.—*Alexander G. McAdie.*

Colorado.—The mean temperature was 65.2°, or 2.7° above normal; the highest was 107°, at Rogers Mesa on the 28th, and the lowest, 21°, at Wagonwheel Gap on the 4th and 15th. The average precipitation was 1.29, or about normal; the greatest monthly amount, 5.62, occurred at Wallet, and the least, trace, at Twinlakes.—*F. H. Brandenburg.*

Florida.—The mean temperature was 79.4°, or 0.5° below normal; the highest was 100°, at Ocala on the 28th, and the lowest, 58°, at St. Francis on the 2d. The average precipitation was 9.57, or 2.72 above normal; the greatest monthly amount, 17.94, occurred at Fort Meade, and the least, 2.90, at Jupiter.—*A. J. Mitchell.*

Georgia.—The mean temperature was 75.6°, or 1.9° below normal; the highest was 99°, at Fitzgerald on the 30th, and the lowest, 53°, at Dahlonega on the 22d. The average precipitation was 8.98, or 4.58 above normal; the greatest monthly amount, 15.88, occurred at Griffin, and the least, 2.95, at Lumpkin.—*J. B. Marbury.*

Idaho.—The mean temperature was 65.5°, or 4.4° above normal; the highest was 109°, at Hailey on the 22d, and the lowest, 24°, at Marysville on the 9th. The average precipitation was 0.52, or 0.31 below normal; the greatest monthly amount, 3.92, occurred at Murray, and the least, trace, at Downey.—*S. M. Blandford.*

Illinois.—The mean temperature was 71.0°, or 1.5° below normal; the highest was 95°, at Monmouth on the 7th, at Mount Pulaski on the 28th and at Palestine on the 29th, and the lowest, 39°, at Chemung on the 3d. The average precipitation was 4.28, or 0.07 above normal; the greatest monthly amount, 10.74, occurred at Raum, and the least, 0.42, at Knoxville.—*M. E. Blystone.*

Indiana.—The mean temperature was 71.1°, or 1.0° below normal; the highest was 99°, at Laporte on the 24th, and the lowest, 42°, at Logansport on the 2d. The average precipitation was 5.54, or 1.70 above normal; the greatest monthly amount, 14.31, occurred at Vincennes, and the least, 1.82, at Laporte.—*C. F. R. Wappenhans.*

Iowa.—The mean temperature was 69.7°, or about normal; the highest was 102°, at Odebolt on the 26th, and the lowest, 38°, at Larrabee on the 2d. The average precipitation was 3.98, or slightly below normal; the greatest monthly amount, 12.35, occurred at Mason City, and the least, 0.67, at Le Clair.—*J. R. Sage, Director; G. M. Chappel, Assistant.*

Kansas.—The mean temperature was 74.9°, or 1.1° above normal; the highest was 110°, at Ulysses on the 27th, and the lowest, 43°, at Scott on the 4th and at Achilles on the 8th. The average precipitation was 3.68, or 0.65 below normal; the greatest monthly amount, 10.30, occurred at Ottawa, and the least, 0.55, at Delphos.—*T. B. Jennings.*

Kentucky.—The mean temperature was 73.9°, or 0.9° below normal; the highest was 100°, at Fords Ferry on the 12th, and the lowest, 40°, at Vanceburg on the 4th. The average precipitation was 6.14 or 2.48 above normal; the greatest monthly amount, 13.31, occurred at Hopkinsville, and the least, 1.85, at Frankfort.—*H. B. Hersey.*

Louisiana.—The mean temperature was 79.3°, or nearly normal; the highest was 101°, at Libertyhill on the 17th, and the lowest, 60°, at Minden on the 22d and at Southern University Farm on the 25th. The average precipitation was 8.40, or 2.37 above normal; the greatest monthly amount, 17.61, occurred at Schriever, and the least, 3.81, at Plain Dealing.—*W. T. Blythe.*

Maryland and Delaware.—The mean temperature was 71.4°, or 0.3° above normal; the highest was 100°, at Hancock, Md., on the 11th, and the lowest, 36°, at Sunnyside, Md., on the 21st. The average precipitation was 4.75, or 1.60 above normal; the greatest monthly amount, 10.94, occurred at Washington, D. C., and the least, 1.48, at Sudlersville, Md.—*Oliver L. Fassig.*

Michigan.—The mean temperature was 63.3°, or 1.3° below normal; the highest was 96°, at Harrisville on the 26th, and the lowest, 22°, at Washington Harbor, Isle Royal, on the 3d and 9th; in the State proper the lowest temperature was 24°, at Humboldt, on the 8th. The average precipitation was 2.68, or 0.44 below normal; the greatest monthly amount, 5.10, occurred at Petoskey, and the least, 0.49, at Lincoln.—*C. F. Schneider.*

Minnesota.—The mean temperature was 66.8°, or 0.8° above normal; the highest was 102°, at Hallock on the 25th, and the lowest, 28°, at Pokegama on the 30th. The average precipitation was 1.71, or 2.28 below normal; the greatest monthly amount, 7.52, occurred at Milaca, and the least, 0.32, at Morris.—*T. S. Outram.*

Mississippi.—The mean temperature was 77.6°, or about 2.5° below normal; the highest was 99°, at Brookhaven on the 18th, and the lowest, 47°, at Louisville on the 3d. The average precipitation was 12.10, or about 7.85 above normal; the greatest monthly amount, 23.30, occurred at Americus, and the least, 5.50, at Natchez.—*H. E. Wilkinson.*

Missouri.—The mean temperature was 73.2°, or 0.5° below normal; the highest was 103°, at Sarcoxie on the 27th, and the lowest, 44°, at Bethany on the 11th. The average precipitation was 4.85, which is practically normal, but it was very unevenly distributed, portions of the central and eastern sections receiving much more than the usual amount, while over many of the northern and western counties there was a marked deficiency; the greatest monthly amount, 9.07, occurred at Gayoso, and the least, 1.12, at Bethany.—*A. E. Hackett.*

Montana.—The mean temperature was 65.6°, or 5.2° above normal; the highest was 109°, at Chinook on the 21st, and the lowest, 25°, at Adel on the 10th. The average precipitation was 1.01, or 1.89 below normal; the greatest monthly amount, 5.01, occurred at Dupuyer, while none fell at Crow Agency, Livingston, and Red Lodge.—*E. J. Glass.*

Nebraska.—The mean temperature was 72.5°, or 2.8° above normal; the highest was 110°, at Palmer on the 27th, and the lowest, 37°, at Fort Robinson on the 9th. The average precipitation was 2.50, or 1.35 below normal; the greatest monthly amount, 7.58, occurred at Weepingwater, and the least, 0.25, at Johnstown.—*G. A. Loveland.*

Nevada.—The mean temperature was 67.7°, or about 3.8° above normal; the highest was 111°, at Las Vegas on the 29th, and the lowest, 28°, at Palmetto on the 16th. The average precipitation was 0.32, or about 0.14 below normal; the greatest monthly amount, 1.08, occurred at Reno, while none fell at several stations.—*J. H. Smith.*

New England.—The mean temperature was 65.7°, or 0.8° above normal; the highest was 105°, at Bemis, Me., on the 1st, and the lowest,